Book One – answer guide

SAQ 1

A 33yo male is brought to ED following a suicide attempt with ingestion of an unknown substance 4hrs prior to presentation.
Vital signs:
HR 105
BP 142/79
RR 30
SaO2 94% 6L HMO2
GCS E2V3M4 = 9
An urgent ABG and bloods are collected with the following results:

pH	7.02
pCO2	20
pO2	85
HCO3	8
Lactate	8.2
Glucose	8
Urea	24
Creatinine	210
Osmolarity	299
Na	142
K	4.0
Cl	106
Ca	1.9
Mg	0.8

i. Describe the acid-base disturbances (2 marks)

Severe acidaemia
RAGMA
AG = 142 – (106+8) = 142-114 = 28
*Delta ratio = (28-12)/(24-8) = 1 → **isolated RAGMA** with elevated lactate*
*Expected PCO2 = (1.5x8)+ 8 = 20 → **compensatory respiratory alkalosis (appropriate)***

ii. What 3 other abnormalities are present on the ABG? What is the likely diagnosis and why? (5 marks)

1. elevated osmolar gap
Calc osm = 2x142 + 24 + 8 = 316
Osmolar gap = 316 – 299 = 17>10
2. hypocalcaemia

3. renal impairment
(4. elevated lactate)

→ ETHYLENE GLYCOL TOXICITY

- ***RAGMA with elevated lactate and elevated osmolar gap, associated with hypcalcaemia and rising creatinine = pathognomonic of EG toxicity***

iii. List 2 other investigations you would request and your rationale for each. (4 marks)

Blood alcohol level - ?co-ingestion
Serum ethylene glycol level – to determine need for haemodialysis (>8mmol/L) though usually not readily available and decision to haemodialyse based on other factors
Urine microscopy - ?Ca oxalate crystals in urine

ii. The patient goes on to have a generalised tonic-clonic seizure lasting 5mins. Describe 6 steps in your management of this patient. (6 marks)

Transfer to RR and attach non-invasive monitoring

IV diazepam (5-10mg) for termination of seizure

RSI/intubation for airway protection with seizure and poor GCS: maintain hyperventilation to continue respiratory compensation

Administer antidote: ethanol IV 8ml/kg loading 10% ethanol, continue 1-2ml/kg/h

Correct hypocalcaemia: CaCl 10ml IV over 5mins

IV NaHCO3 1-2mmol/kg for correction of acidosis

Arrange for haemodialysis – indications:

- *large EG ingestion with osmolar gap>10*
- *pH<7.3*
- *acute renal failure*
- *EG level >8mmol/L*

Admit patient to ICU for monitoring and haemodialysis treatment

SAQ 2

You are the consultant on duty in an urban district ED. You are called to triage where an angry father is shouting 'this hospital missed that my son has a broken hand '. The father is accompanied by a 12 year old son, Max, who carries a letter from GP stating that the GP has looked up the x-ray report for Max, who was seen in your ED 3 days prior with hand pain after a fall. The x-ray report states there is a displaced scaphoid fracture.

i. How do you initially manage this situation at triage? (2 marks)

- Introduce yourself/ Identify yourself as senior staff member
- Aim to verbally de-escalate the Father and offer to take him to a private area to talk
- Acknowledge his distress. Reassure him that you would like to hear more about the case/ take his concerns seriously
- arrange immediate treatment for Max

Anything sensible that involves acknowledging problem/ de-escalation

Must not 'blame' anybody, or offer explanation without investigation first.

ii. What are your immediate clinical priorities? (3 marks)

Need to be **clinical** interventions

- **Analgesia**
- **Immobilisation**
- +/- repeat imaging
- **Orthopaedics / hands consult**

iii. Max's father puts in a formal complaint about Max's care during his initial presentation to ED. What are your next steps in terms of investigating this matter further? (5 marks)

- Formally acknowledge the complaint/ incident in writing with an expected time frame for how long the review process will take
- Inform patient liaison/ complaints and the quality department
- **Review the medical notes/ documentation**
- Interview the staff involved and support them
- **Review the department's results checking processes / any departmental guidelines or policies relating to the presentation**
- Formalise your findings and any recommendations in written format and write any actions arising from this (eg review a change in policy etc)

- Present your findings in department M&M
- **Provide education to department/ the staff involved** (individual education or as a department, eg formal teaching sessions)
- **Feedback your findings to patient / patient's family,** with an apology, if appropriate

iv. You wish to develop a policy to formalise the radiology results checking process for the department. What are the main features of a policy document? (4 marks)

- **Statement of intent – why/ what**
- **Purpose – for whom/ rationale**
- Scope – who or what is affected
- **Expected outcomes**
- Related policies/ references
- Outline the expected procedure or recommendation – **clearly list the steps involved**
- What documentation is expected for this procedure
- Any associated education/ training
- Who authorises/ approves this policy

SAQ 3

You have observed a trainee perform a physical exam on a 70-year-old gentleman who had a syncope walking up stairs. He has been breathless on exertion for 1 year.

Your trainee finds no abnormality on examination and considers that he is suitable for discharge if baseline blood tests, 12 lead ECG and a period of monitoring do not reveal any abnormality.

You decide to examine him yourself. You find a mid-systolic murmur, that radiates to the carotids and crepitations (crackles) to the midzones in both lung fields.

a) What is your differential diagnosis of this murmur and the significance of each option? (8 marks)

Condition	Typical features on auscultation (half mark per point -total 1mark)	Clinical significance (1 mark)
Aortic stenosis	• Mid-systolic / ejection systolic murmur, • crescendo-decrescendo, • radiates to carotids; • if severe, also crackles / breathless / S4	Syncope and exertional dyspnoea suggest this would be severe AS
Aortic sclerosis	• Mid-systolic murmur, • crescendo-decrescendo, radiates to carotids as per AS	None (incidental finding)
Hypertrophic obstructive cardiomyopathy	• Mid-systolic murmur, • crescendo-decrescendo. • Active manoeuvres to DDx it from AS	Like the AS- if causing syncope this is significant!
Mitral regurgitation	• Pansystolic murmur so unlikely to be this- but can be mistaken. • Acute MR due to papillary rupture can be ejection systolic, but patient would be in extremis.	Like AS, the associated findings would suggest this is severe

b) What is your advice to the trainee on this patient's disposition, including your rationale? (2 marks)

a. Your advice:

Admit under cardiology for inpatient workup eg TTE-. (or at the very least needs a cardiology consult while in ED and early followup arranged)
Avoid nitrates / diuretics.

b. Your rationale:

Previously undiagnosed AS most likely, and clinically this would be severe given the syncope, dyspnoea and crackles. Needs identification of severity of AS, commencement of treatment and monitoring.

c) Your trainee had asked for this case to be a CEX but now doesn't want to because they did poorly. You become aware that other consultants have had the same issue regarding underperformance. As the DEMT you decide to meet with the trainee and discuss a performance plan.

a) List 4 early warning signs of a trainee in difficulty (2 marks)

++ Disappearing; not answering pagers; lateness; frequent sick leave;
++ Slow in performing procedures;
++ Reluctant to make decisions;
++ Difficulty in prioritising;
++ Failure to seek advice appropriately;
++ Lack of initiative;
++ Fellow trainees and nursing staff avoid seeking the trainee's opinion or help;
++ Not completing WBAs or ITAs;
++ Deferring tasks to others, avoiding tasks;
++ Lack of insight into limitations.

b) List the parts of a performance plan. (4 marks)

1. *Identify the performance area that needs improvement*
2. *Provide specific examples of poor performance*
3. *Discuss reasons that could be causing poor performance*
4. *Create a performance action plan with a set of goals and time frames for next meetings and reviews*

SAQ 4

You are the consultant working in a mixed rural ED. A 2 year old girl is brought in by her mother with a petechial rash on her legs noticed in the past few hours.

i. Define or describe the difference between "petechiae" and "purpura" (2 marks)

- Petechiae are small (or "pinpoint") purpuric lesions < 2mm across
- Purpura are larger non-blanching spots

ii. What are the differentials for non-blanching/ petechial rash in children? (6 marks)

[Must have meningococcal, HSP and ITP]

- Thrombocytopenia
  - Increased destruction: **ITP, TTP**,
  - Decreased production: Malignancy (**leukaemia**), aplastic anaemia, drug-induced, radiation therapy, Fanconi anaemia, lympho-proliferative disorders
  - sequestration
- Platelet dysfunction
  - Congenital
  - Acquired: drug/ toxin induced (NSAIDs)
- Coagulation deficiencies
  - Congenital: Factor VIII deficiency, **von willebrand disease**
  - Acquired: Liver disease, uraemia, vitamin K defieicncy
- Loss of vascular integrity:
  - Trauma/ Increased venous pressure: **coughing, vomiting, tourniquet, strangulation**
  - Vasculitis: **Henoch Schonlein Purpurae,** SLE
  - Toxins: penicliins, steroids, sulfonamidses
  - Sepsis: DIC, HUS, Infection (TORCH, vial, bacterial eg **meningococcal**)

iii. The child's observations are: T 36.8, HR 110, RR 26, sats 98% RA, she is alert and acting appropriately for age. What key investigations would you do in ED? (4 marks)

- FBC – **platelets/ cell line**
- **Urinalysis**

- **Inflammatory markers (WCC, CRP)**
- Blood pressure
- Consider coagulation

iv. What criteria would need to be met to safely discharge this child from ED? (3 marks)

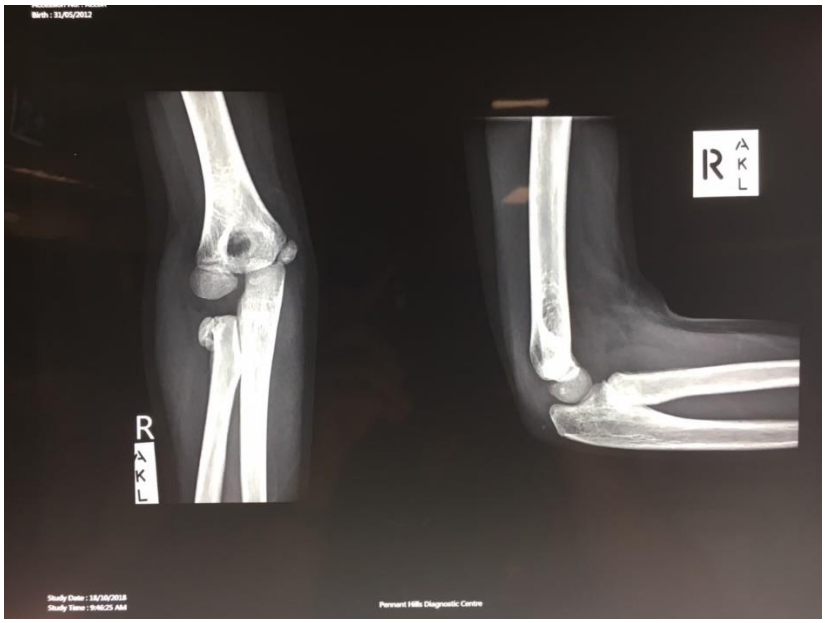
- Normal obs
- Lack of fever
- Low risk sinister cause (CRP < 8, WCC 5- 15 etc), likely non sinister cause
- Period of observation, stable
- Physical Senior review
- Safety nets explained – reasons to represent etc, parents sensible etc
- Appropriate early follow up arranged – paeds/ GP etc

SAQ 5

A 7 year old girl returns to the ED with private films. She was seen four weeks ago with elbow pain and diagnosed with a sprain.

An x-ray is reproduced in the Props Book

i. Describe both x-rays noting relevant negatives (4 marks)



Right elbow AP and lateral films.

AP film: **fracture through radial neck with head displaced (>100%)**.

Lateral film: Probable large anterior & small posterior fat pad. Bony lines intact: anterior humeral and radiocapitellar lines.

ii. The doctor involved has had a number of missed injuries recently and you are concerned about burn out. List five symptoms or signs of burn out (5 marks)

-general exhaustion and fatigue
-lack of motivation in life
-cynicism and negativity
-difficulty concentrating and task completion
-deterioration in job performance
-interpersonal problems outside work

-unhealthy lifestyle choices
-poor job satisfaction
-constant pre-occupation with work
-development of health issues eg depression, obesity, HTN

iii. Shift work is a possible contributor to burn out. Night shifts present specific challenges to well-being. List four personal and four organisational strategies that can be implemented to minimise these difficulties (8 marks)

Personal Strategies

-exercise before sleeping

-outside time with exposure to natural light before sleep

-well darkened room to sleep during daytime

-eating healthy food, avoiding junk food

-melatonin to help reset Circadian rhythm

Organisational strategies

-adequate staffing for the ED overnight

-rostered senior staff oncall

-adequate bed flow without access block, no boarding in ED

-rostering in shorter blocks eg 4 nights not 7 in a row.

-days off to recover after nights

SAQ 6

A 25yo male is brought to ED following assault with a cricket bat one hour ago. He had a witnessed loss of consciousness for 5mins at the scene, with current GCS 14 (E4V4M6).

i. Aside from intracranial haematoma, list three possible early complications of head trauma, and give two signs that would suggest the presence of each complication: (6 marks)

Complication	Sign
Increased ICP	*anisocoria* *altered mental state* *hypertension* *bradycardia* *papilloedema* *decorticate/decerebrate posturing*
Base of skull fracture	*Battle sign (postauricular haemorrhage)* *haemotympanum* *CSF otorrhoea/rhinorrhoea* *Subconjunctival haemorrhage*
Cranial nerve injury	*visual loss/defect* *reduced eye movements* *facial asymmetry*

Others:
Contusions – decreased GCS, seizure
Aspiration pneumonia – reduced air entry, hypoxia, tachycardia, fever, tachypnoea
Neurogenic cardiac dysfunction
Neurogenic pulmonary oedema – hypoxia, crepitations, tachypnoea

ii. List the five high risk and the two medium risk features of the Canadian CT Head Rule (5 marks)

<u>Canadian CT rules:</u>
HIGH RISK
- GCS <15 at 2h after injury
- suspected open or depressed skull #
- any sign of basal skull #: haemotympanum, 'racoon' eyes, CSF otorrohoea/rhinorrhoea, Battle's sign
- vomiting > or +2 episodes
- age >65yo
MEDIUM RISK

- amnesia before impact >30min
- dangerous mechanism (pedestrian v. MVA, ejection from vehicle, fall from height >3ft or 5 stairs)

iii. If a significant traumatic brain injury is detected in this patient, what measures should be taken to prevent secondary brain injury? (5 marks)

Maintaining cerebral oxygen supply:

- **Normoxia**: keep the PaO_2 above 60 mmHg
- Low **normocapnia**: keep the $PaCO_2$ between 35-40 mmHg
- **Normotension**: measure the MAP, and keep the systolic above 90mmHg
- Intracranial Pressure monitoring: keep it under 20mmHg
- Cerebral perfusion pressure: keep it 50-70mmHg
- Cerebral oxygenation monitoring:keep the SjO_2 >50%, and $PbrO_2$ >55mmHg
- Managing increased intracranial pressure for which there is a variety of strategies:
  - Draining the EVD (about 20ml/hr, max)
  - **Head up 30 degrees**
  - Positioning the head straight
  - **Removing the C-spine collar**
  - Sedation :
    - Propofol sedation to decrease distress and thus decrease ICP
    - Barbiturate coma if other methods of lowering ICP have failed
    - Analgesia to prevent increased ICP in response to suctioning and routine care
  - Paralysis
  - Osmotherapy
  - Controversial measures
    - Decompressive craniectomy
    - Hypothermia
    - Dexamethasone

Decreasing cerebral oxygen demand:

- Sedation
  - Propofol sedation to decrease distress and thus decrease ICP
  - Barbiturate coma if medical and surgical methods of lowering ICP have failed
- Analgesia - opioid selection is irrelevant, but opiate boluses increase ICP
- **Seizure prophylaxis** is infrequently indicated, and the course is 7 days only

SAQ 7

A 36 hour old neonate presents with a community nurse because of failure to pass meconium. There has been mucous-like vomiting but the neonate otherwise looks well. PR, BP, RR and saturations are within normal ranges.

i. With regard to this presentation, (4 marks)

(a) A normal digital rectal examination excludes which diagnosis?
Imperforate anus

(b) The successful passage of an NG tube excludes which diagnosis?
Oesophageal atresia

(c) What is the characteristic X-ray appearance of duodenal atresia?
Double bubble sign

(d) Name a congenital condition associated with neonatal bowel obstruction.
Down syndrome, Cystic fibrosis

ii. Prior to transport to a specialist paediatric centre name 5 essential actions you should perform in ED to ensure the safety of the neonate in transfer (5 marks)

Vital signs documentation
Oxygen as required to maintain saturations
Temperature measurement and balance
BSL measurement and correction if < 3mmol/L
Establish iv access and place nbm
Establish iv fluid maintenance
Place a ng tube on free drainage
Abdominal X-ray

iii. Describe the intravenous maintenance fluid choice and maintenance fluid rate you would prescribe for this neonate prior to transfer. (2 marks)

Fluid; N/2 +10% dextrose or N/4 + 10% dex
Rate 4ml/kg/hr; might state 3.75-5ml/kg/hr or 90-120ml/kg/day

iv. Name 2 other potential causes of neonatal intestinal obstruction at this age not

Enteric duplication cysts, Gastric volvulus, Gastric atresia, Microgastria, Duodenal web Malrotion. Jejunal stenosis and atresia. Small bowel obs. Ileal atresia Intestinal mal rotation. Meconium ileus, meconium plug Small left colon syndrome. Intussusception. Intestinal atresia, Colonic atresia, Hirshprungs. Anal atresia, Anorectal abnormalities

SAQ 8

A 48 year old female presents to your emergency department with 24 hours of mild chest discomfort and exertional dyspnoea. She is normally well without significant past history or regular medications. She occasionally smokes cigarettes Her observations at triage are

Pulse 80 bpm BP 137/70 mmHg Afebrile RR 22/minute Sats 94%

i. Describe and interpret her PA CXR (2 marks)

Left sided **pneumothorax.** BTS guideline moderate to large 1-2cm interpleural measured at the hilum

ii. In the following table list 2 historical features and their implications for your management decisions (4 marks)

Historical feature

Primary vs. Secondary

- Hx of prior pneumothorax/ipsilateral pneumothorax
- Known underlying lung disease etc.
- **Implication - More likely** to require intervention than conservative in secondary/recurrent
  (Something sensible)

Symptomatology

Breathless. Chest pain. (Sensible) **Implication** – more symptomatic - more likely to require intervention rather than conservative

Patient factors

- Consent/pt. wishes/special considerations (job e.g. pilot etc.)

iii. Describe a radiological feature that may influence your management (2 marks)

Large vs. small. Could also have midline shift/radiological ?tension

BTS vs. ATS rules e.g. >2cm interpleural = large → More likely to require intervention. Something sensible

iv. List and justify 2 possible management strategies (4 marks)

Conservative. Minimal symptomatology at rest. 1st Primary pneumothorax suspected without obvious underlying structural abnormality on CXR. Patient preference etc. Progress film e.g. 6-12 hours for stability. Follow up progress film 2 weeks

Simple aspiration 16-18 G needle <2.5 litres
Faster resolution of symptoms/size in primary spontaneous
Pt. preference
Early discharge

Chest drain e.g. pig tail. 8-14F
Secondary pneumothorax suspected (recurrence/underlying lung disease)
Significant symptoms
Chest discomfort not controlled with simple analgesics (sensible)

v. You decide she can be discharged based on your assessment and management. What discharge advice would you provide to her? (4 marks)

Follow up – LMO vs. resp physician and timing. Progress film e.g. 2-4 weeks.
High risk activity advice (1). No flying until full resolution/clearance by resp physician (sensible)
No diving at any point (unless surgical fixation and normal CT with clearance)
Return advice - Recurrence/worsening of symptoms e.g. SOB/chest pain
Cessation of smoking - Likely single most important causal factor

SAQ 9

A 29 year old female is brought to your emergency department by ambulance with a sudden onset of severe shortness of breath one hour prior to presentation. She is previously well and her only medications are the oral contraceptive pill. She has no allergies.

Vital Signs

- Temperature - 36.5
- Pulse rate -130 bpm
- Blood pressure - 80/ 60 mmHg
- Saturations - 82% on room air
- Respiratory rate -55 bpm

She is cyanosed and talking in short sentences only

i. List three differential diagnoses in order of probability (3 marks)

1. *PE (first)*
2. *Cardiogenic shock due to things like myocardial infarction or dissection with tamponade*
3. *Severe sepsis with rapid progression as in meningococcal or staph pneumonia*
4. *Poisoning with something that causes respiratory or cardiac compromise very quickly*

ii. List 4 possible indications for thrombolysis in patients with pulmonary embolus. Indicate the one most clearly shown to decrease mortality (5 Marks)

- Shock (BP <90 systolic or a drop of 40 from baseline with signs of shock)
- Severe or worsening right ventricular dysfunction ("submassive PE")
- Cardiopulmonary arrest due to PE (eg, BP >90 mmHg after resuscitation)
- Extensive clot burden (eg, large perfusion defects on ventilation/perfusion scan or extensive embolic burden on computed tomography)
- Free-floating right atrial or ventricular thrombus
- Severe hypoxia
- Worsening despite anticoagulation

(cf up to date accessed Sept 2018)

iii. List 3 diagnostic tests for pulmonary embolism along with a description of what a positive result would look like for each test. (6 marks)

Test	*Positive result*
Bedside echo	***Severe RV dilatation +/- compression of LV.*** *(thrombus in RA or RV, absence of RV hypertrophy, dilated IVC, TVR showing high RV pressures)*
CTPA	*Filling defects in major pulmonary vessels*
V/Q	*Unmatched perfusion defects*
D Dimer	*Positive > 0.5*
Pulmonary angiogram	*catheter through IV*
MRI pulmonary angiogram	*Ok for picking big PEs in major vessels may be an option for pregnant women (but not in this case- too unstable)*
ECG	*Simultaneous T wave inversions in the inferior (II, III, aVF) and right precordial leads (V1-4) is the most specific finding (99% in one study)* *Sinus tachycardia – the most common abnormality; seen in 44% of patients* *Lots of other abnormalities* *Complete or incomplete RBBB – associated with increased mortality; seen in 18% of patients.* *Right ventricular strain pattern – T wave inversions in the right precordial leads (V1-4) ± the inferior leads (II, III, aVF). This pattern is seen in up to 34% of patients and is associated with high pulmonary artery pressures.*

	Right axis deviation – seen in 16% of patients. Extreme right axis deviation may occur, with axis between zero and -90 degrees, giving the appearance of left axis deviation ("pseudo left axis"). *Dominant R wave in V1 – a manifestation of acute right ventricular dilatation.* *Right atrial enlargement (P pulmonale) – peaked P wave in lead II > 2.5 mm in height. Seen in 9% of patients.* ***SI QIII TIII pattern** – deep S wave in lead I, Q wave in III, inverted T wave in III. This "classic" finding is neither sensitive nor specific for pulmonary embolism; found in only 20% of patients with PE.* *Clockwise rotation – shift of the R/S transition point towards V6 with a persistent S wave in V6 ("pulmonary disease pattern"), implying rotation of the heart due to right ventricular dilatation*

iv. Indicate which test you would use to make the decision to thrombolyse *in this case* and why (2 marks)

The test could be any of the above apart from ddimer (too slow and non specific) and MRI and v/q (too slow)

The reason why should indicate the need for speed and some specificity.

They can say it depends on what is available at their place of work.

For echo and ecg the benefits of not having to move the patients

v. List 2 contraindications to thrombolysis for pulmonary embolism. Indicate if they are absolute or relative (2 marks)

Absolute contraindications

- *Previous intracranial haemorrhage*

- *Structural intracranial disease*
- *Ischaemic stroke within 3 months*
- *Recent brain or spinal surgery*
- *Recent head trauma with fracture or brain injury*
- *Active bleeding*

Relative contraindications

- *Traumatic cardiopulmonary resuscitation <10 days*
- *Recent bleeding: major <6 months; minor <10 days if in non-compressible site*
- *Recent surgery (< 3 months) or invasive procedure*
- *Ischaemic stroke > 3 months previously*
- *GI ulceration or varices in last 3 months*
- *Malignancy with bleeding risk*
- *Anticoagulation prior to presentation*
- *Diabetic retinopathy*
- *Pregnancy*
- *Endocarditis, pericarditis or pericardial effusion*
- *Acute pancreatitis,*
- *Age >75 Low body weight <60kg*
- *Systolic >180mmHg or Diastolic >110mmHg*

1. Kearon, C., Akl, E.A., Comerota, A.J. et al. Antithrombotic therapy for VTE disease. Antithrombotic therapy and Prevention of thrombosis, 9th ed. American College of Chest Physicians. Chest 2012; 141 (2) (Suppl): e419s 2. Actilyse (Alteplase) Prescribing Information (PI), TGA website